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THE WORLD CRISIS OF THE IRON AND STEEL INDUSTRY AND ITS IMPACT IN THE DEVELOPMENT OF THIS INDUSTRY IN DEVELOPING COUNTRIES*

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* The views expressed in this paper are those of the author and do not necessarily reflect the views of the UNIDO secretariat. This document has been translated from an unedited original.

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I - THE CRISIS OF THE IRON AND STEEL INDUSTRY

The crisis of the world iron and steel industry, which became so suddenly manifest in 1974, still continues in 1985.

1 - Global changes in the production and consumption of steel show clearly the continuing nature of the crisis.

The world production of steel (crude steel),

which reached the level of	:	710 million tonnes in 1974[1]
collapsed to a level of	:	643 million tonnes in 1975,
then rose again to	:	716 million tonnes in 1978,
and then up to	:	746 million tonnes in 1979.
only to fall again to	:	645 million tonnes in 1982.

A recovery began in 1983 with a production of 663m tonnes; the recovery was maintained in 1984 with a production of 710m tonnes. It is estimated[1] that production will either remain stable or rise only very slightly in 1985, reaching a level very slightly below that of 1978 but very much lower than the 1979 level. Although between 1960 and 1974 the world production of steel doubled (from 346mt to 703mt) it hardly increased at all between 1974 and 1985.

A CONTRASTED DEVELOPMENT

The development of iron and steel production and consumption has varied very considerably from one region of the world to another.

2 - IN THE UNITED STATES the crisis in the iron and steel industry has been very grave, as may be seen from the following figures for the apparent consumption and production of steel[2].

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(1) Statistics and forecasts of the International Iron and Steel Institute (IISI) of Brussels.

(2) Source : IISI.

TABLE 1 : EVOLUTION OF THE PRODUCTION AND APPARENT CONSUMPTION OF STEEL IN THE UNITED STATES (in millions metric tonnes)

Year	Production	Apparent consumption
1974	132.1	144.1
1975	105.8	116.9
1976	116.1	129.9
1977	113.7	133.9
1978	124.3	146.4
1979	123.6	140.9
1980	101.4	115.5
1981	109.6	129.7
1982	67.6	84.2
1983	76.7	94.5
1984	85.0	114.0

The crisis has been very grave, particularly since 1982. The apparent consumption has fallen to below the 1964 level, whilst production, which fell so drastically from 1982 onwards, was still below the 1960 figure in 1984!

3 - IN THE EUROPEAN ECONOMIC COMMUNITY the situation of the iron and steel industry is almost as bad as in the United States.

TABLE 2 : EVOLUTION OF THE PRODUCTION AND APPARENT CONSUMPTION OF STEEL IN THE EEC[3] (in millions metric tonnes)

Year	Production	Apparent consumption
1974	156.3	123.1
1975	126.3	99.3
1976	134.7	117.2
1977	126.7	106.4
1978	133.3	103.5
1979	141.9	113.5
1980	128.7	105.7
1981	126.4	94.1
1982	111.4	91.4
1983	109.5	85.0
1984	119.0	90.0

(3) Source : IISI

In 1984 iron and steel production was lower than that of 1968, whereas apparent consumption was lower than that of 1964.

Within the EEC itself there were contrasts between the various countries: for example between Great Britain, where production collapsed between 1974 and 1984 from 22.300mt to 14.986mt, and Italy where production rose slightly from 23.8mt to 23.9mt.

4 - IN JAPAN the iron and steel industry resisted the crisis more effectively than the industries of the USA and the EEC.

TABLE 3 : EVOLUTION OF THE PRODUCTION AND APPARENT CONSUMPTION OF STEEL IN JAPAN[4] (in millions metric tonnes)

Year	Production	Apparent consumption
1974	117.0	79.0
1975	102.0	68.0
1976	106.0	65.0
1977	102.0	63.0
1978	102.0	67.0
1979	112.0	78.0
1980	111.0	79.0
1981	102.0	71.0
1982	100.0	70.0
1983	97.0	66.0
1984	106.0	74.0

The Japanese domestic market has held up well: the consumption in 1984 is approaching that in 1974, whilst the production in 1984 is higher than it was in 1972.

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(4) Source : IISI

5 - IN THE CMEA COUNTRIES the rate of growth in both the production and the apparent consumption of steel has shown a clear falling-off since the end of the last decade.

TABLE 4 : EVOLUTION OF THE PRODUCTION AND APPARENT CONSUMPTION OF STEEL IN THE CMEA COUNTRIES[5] (in millions metric tonnes)

Year	Production	Apparent consumption
1974	185.0	188.9
1975	192.6	195.1
1976	198.9	200.9
1977	204.1	204.0
1978	211.0	212.0
1979	209.4	210.9
1980	209.1	209.1
1981	206.1	205.3
1982	203.4	204.1
1983	210.1	210.9
1984	212.0	213.0

The overall balance of external trading, traditionally in deficit, is now tending to become balanced.

6 - THE DEVELOPING COUNTRIES, INCLUDING CHINA AND THE DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA

This is the only group of countries where the iron and steel industry has shown a positive rate of growth since 1974: production increased from 30.6m tonnes in 1974 to 107.3m tonnes in 1983, whilst the consumption rose from 99.0m tonnes in 1974 to 155.0m tonnes in 1984.

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(5) Source : IISI

TABLE 5 : EVOLUTION OF THE PRODUCTION AND APPARENT CONSUMPTION OF STEEL IN THE DEVELOPING COUNTRIES[6] (in millions metric tonnes)

Year	Production	Apparent consumption
1974	55.0	99.2
1975	59.3	100.3
1976	60.6	101.9
1977	71.2	116.0
1978	84.9	139.3
1979	94.3	146.3
1980	99.7	152.7
1981	99.3	150.0
1982	103.1	140.7
1983	109.3	140.1
1984	119.0	153.7

7 - Within the group of developing countries there are contrasted patterns of development. These countries resisted the crisis reasonably well in general in 1974-1975, whilst several of them were severely affected from 1981 onwards. The marked fall in levels of activity in Africa and Latin America were compensated for by the dynamism of South-East Asia and the Far East, in particular China.

TABLE 6 : CONTRASTED DEVELOPMENT IN THE DEVELOPING COUNTRIES[7] (in millions metric tonnes)

YEAR	PRODUCTION				APPARENT CONSUMPTION			
	Latin Amer.	Africa	Asia	China + DPRK	Latin Amer.	Africa	Asia	China + DPRK
1974	17.7	1.4	11.0	24.3	30.6	7.2	23.2	29.2
1975	18.6	1.4	12.1	26.8	29.4	7.15	20.6	32.1
1976	19.4	1.7	15.6	23.5	26.9	8.5	23.8	29.9
1977	22.0	1.9	19.9	27.7	29.9	10.7	28.5	34.5
1978	24.3	2.1	20.2	36.8	32.3	10.5	34.1	47.8
1979	27.4	2.2	23.1	39.8	32.3	11.2	36.7	49.9
1980	29.1	2.4	21.6	42.9	36.9	12.9	38.7	49.1
1981	27.3	2.4	26.8	41.1	34.8	13.5	41.6	44.9
1982	27.0	2.4	29.1	42.9	28.5	9.2	42.2	48.1
1983	28.8	2.7	29.6	46.1	22.7	9.4	42.3	58.7
1984	33.0	2.7	33.3	50.0	28.5	-	-	-

(6) Source : IISI

(7) Source : IISI - Africa : excluding South Africa
Asia : excluding Japan, China and the DPRK
DPRK : Democratic People's Republic of Korea.

Over a period of ten years production was multiplied :

by 2 in Latin America,
by 2 in Africa,
by 3 in Asia, and
by 2 in China and the DPRK.

Over the same period the apparent consumption was multiplied :

by 1.3 in Africa,
by 1.8 in Asia, and
by 2.0 in China and the DPRK,

whilst over the same period it fell in Latin America.

During this same period the participation of the developing countries in world iron and steel activity developed in the following way :

Production : from 7.9% in 1974 to 16.7% in 1984;

Apparent consumption : from 14.0% in 1974 to 21.6% in 1984.

II - THE CONSEQUENCES OF THE CRISIS IN THE WORLD IRON AND STEEL INDUSTRY

The continuing crisis is reflected, amongst other ways, in the following consequences :

- the "end of forecasting",
- restructurings,
- an increase in protectionism,
- an acceleration in technical developments.

8 - THE "END OF FORECASTING"

During the long period when the world iron and steel industry was growing, since the end of the Second World War, many medium- and long-term forecasts were regularly produced :

- by the International Iron and Steel Institute (in 1972 for 1985),
- by the European Economic Community (in 1976 for 1985),
- by UNIDO (in 1976 for 1990 and 2000), etc.

As from 1978 the IISI in Brussels gave up publishing any new medium-term forecasts, it having become clear that, as a result of the crisis, the forecasting methods which had been developed during the period of growth no longer worked, as may be seen from the following table.

TABLE 7 : FORECASTS OF THE APPARENT AND THE EFFECTIVE CONSUMPTION OF STEEL IN 1980[8] (in millions tonnes raw steel)

Countries	IISI Forecasts	Effective consumption	Difference
United States	170.0	115.6	-32%
Canada	16.5	13.3	-19%
Latin America	35.0	37.4	+ 7%
Oceania	12.2	7.2	-41%
EEC (of the Six)	128.8	88.2	-32%
United Kingdom	32.9	13.2	-60%
Other W. European	58.8	36.6	-38%
South Africa	8.2	6.8	-17%
Other African	5.3	9.1	+72%
Middle East	11.3	15.4	+36%
Japan	112.5	73.4	-35%
India	14.4	10.9	-24%
China + DPRK	53.0	49.9	- 7%
Other Asian	22.0	26.3	+18%
USSR + E. Europe	258.0	208.4	-19%
TOTAL	939.0	711.0	-24%

(8) IISI : "Steel Demand Forecasting" - Committee on Economic Studies, Brussels - 1983 No. 2-3.

The only forecasts being put forward today are short-term ones, covering one or two years; the rare medium- and long-term forecasts which are still being published (for 1990 or 1995) still bear the pessimistic traces of the present economic situation. It must be said that there seems to be no other course open than to extrapolate the present trends.

Within this context it can, in any event, be estimated that there is no fear of any shortfall in the coming years, up to the start of the next decade, in respect of either :

- steel, or
- iron ore (cf the Congress of Rome, March 1985), or of course
- coking coal, or
- scrap-iron (cf supplement to the "Monthly Metal Bulletin" of March 1985).

The IISI experts for their part estimate (Chicago Congress, October 1984) that the world apparent consumption of steel in 1995 will hardly catch up with that in 1979 (745mt), the apparent consumption of the developing countries rising to 140m tonnes (excluding China and North Korea) or to 228m tonnes if China and North Korea are included.

I - THE RESTRUCTURING ERA

In the United States, in the European Economic Community but also in Japan the industry has entered an extended period of restructuring.

Restructuring means the modernisation of plant and organisatons, but it also means reductions in production capacities and in personnel.

In the United States, where the major iron and steel groups lost more than $ 2 billion in 1983 and still lost more than $ 300m in 1984, and where first LTV and then Wheeling Pittsburgh had to seek judicial protection(9), the restructuring process is being actively pursued.

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(9) "Filing for bankruptcy protection" - Financial Times of 17 April 1985.

Production capacities (in terms of crude steel) have been reduced from 145m tonnes in 1977 to 120m tonnes in 1984. These reductions are being actively pursued: INLAND STEEL has announced that it is cutting its crude steel production capacity from 9.3m to 6.5m tonnes (-30%), whilst its capacity for cast steel will be reduced to 80% by 1986[10]. The return to a profit situation too partial and too timid to check a process which is already reflected in a reduction in manpower from 453,000 in 1979 to 243,000 in 1984 (-46%).

The European Economic Community has lived under a regime of anti-crisis measures and then of "steel plans" (the Davignon Plan) since 1977. European iron and steel groups have accumulated losses[11]; they have benefitted from subsidies from their governments (for the purposes of modernisation). These subsidies were accepted by the Community up to the end of 1985, subject to reductions in production capacities of 26.7m tonnes (in terms of rolled products), corresponding to slightly more than 15% of the production capacities which existed in 1980[12]. At the present time these reductions in capacities have not been fully implemented, and it does not seem very probable that the subsidies regime can be brought to an end by December 1985, particularly in the case of France and Italy. The market level of the European iron and steel industry did not exceed 60% in 1984 (as compared with 56% in 1982 and 57% in 1983); it is therefore probable that it will be necessary, before long, to move on to further reductions in capacity and to further reductions in manpower (reduced from 637,000 in 1979 to 452,000 in 1984).

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(10) Cf Metal Bulletin of 30 April 1985.

(11) Sometimes estimated at some US$ 27m (early May 1985) (or 250b FF).

(12) These reductions may be broken down as follows :

Germany	6.0
Belgium	3.1
France	5.3
Great Britain	4.5
Italy	5.8
Luxembourg	1.0
Holland	1.0
TOTAL	26.7 million tonnes rolled products.

(Source : Usine Nouvelle, 8 November 1984)

In Japan the iron and steel industry has, until recent months, concentrated on its modernisation with production capacities being held at a more or less constant level (157.8m tonnes in 1982, 156.0m tonnes in 1984). It seems that some change is taking place from the announcement made by Nippon Steel of a major reduction in capacities. Nine blast furnaces are to be demolished out of a total of 25: the blast furnaces concerned, which had been shut down (in 1984, 1982, 1979, 1978, 1977 and 1975) had operated for only ten years. It is probable that these reductions will be followed by others.

The CMEA countries. At the present time these countries are giving high priority to modernising their iron and steel industries so as to improve productivity, profitability and the quality of the product. In several of these countries (Czechoslovakia, Hungary) however no enlargement of the production capacities remains on the agenda.

10 - THE RISE OF PROTECTIONISM

Since the end of the Second World War international trading in iron and steel products has developed more rapidly than their production.

TABLE 8 : EVOLUTION OF INTERNATIONAL TRADING AS A PERCENTAGE OF PRODUCTION
(as millions of tonnes equivalent ingots)[13]

Year	Exports (A)	Production (B)	A/B as percentage
1950	20.5	192.0	10.7
1960	52.7	345.5	15.3
1970	117.5	599.8	19.6
1974	170.0	716.9	23.7
1979	183.5	776.0	23.6
1980	180.3	749.4	24.1
1981	182.4	744.6	24.5
1982	172.6	684.2	25.2
1983	185.2	706.6	26.2

(13) Source : IISI

Exports were maintained at the end of the period although the production was falling off: many iron and steel companies in Japan, the Latin American countries and those in the Far East and Asia have in effect been forced to compensate for the fall in their domestic demands by winning new export markets. In return this has provoked defensive and protectionist reactions.

The EEC - In Europe the coal and steel markets have for many years represented relatively closed markets to countries outside the region. The positive trading balance of the EEC, which was in excess of 26.0m tonnes in 1974, was still 16.0m tonnes in 1983. This balance is particularly favourable towards France where trade between its iron and steel industry and third-party countries varied as follows between 1979 and 1984.

TABLE 9 : EXTERNAL BALANCE OF TRADING BETWEEN THE FRENCH IRON AND STEEL INDUSTRY AND THIRD-PARTY COUNTRIES (in millions of tonnes)[14]

	1979	1980	1981	1982	1983	1984
French imports	0.797	0.800	0.682	1.094	0.836	0.834
French exports	4.639	4.318	4.728	3.510	3.801	4.368

As a result of the crisis the Community has reinforced its protection by asking several of its third-party partners (the CMEA countries, developing countries and other European countries) to sign agreements limiting imports. Negotiations with the "15" were started in 1985 on the basis of a 10% reduction in imports on a 1980 basis; in particular Brazil was asked to reduce its sales to the EEC from 162,000t in 1983 to 103,000t in 1985[15]. There is little chance of any rapid return by the Community to a wider opening-up of its market.

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(14) Source : Statistical Bulletin of the Chambre Syndicale de la Sidérurgie française. External Trade. France - Year 1984, No. 842.

(15) Cf. Metal Bulletin, 18 January 1985.

JAPAN is, traditionally, a market which has been totally closed to iron and steel imports of any provenance. Imports were practically nil at the start of the seventies, and have developed very slowly from that time onwards.

TABLE 10 : EVOLUTIONS IN JAPANESE IMPORTS (in millions tonnes)[16]

	1976	1978	1979	1980	1981	1982	1983
Japanese imports	0.200	0.466	1.617	1.292	1.716	2.217	3.026

In 1983 they accounted for less than 5% of the Japanese domestic market; two-thirds came from South Korea and Taiwan, the remainder from Brazil and Romania. These imports levelled out in 1984, and are expected to fall in 1985[17]. It is however improbable that Japan will be able to maintain such a limited opening to the rest of the world for very long.

The UNITED STATES - For a long time the external balance of trade in iron and steel products has shown a deficit.

TABLE 11 : EVOLUTIONS IN US IMPORTS AND EXPORTS (in millions tonnes)

	1960	1965	1970	1975	1980	1981	1982	1983
Exports	2.7	2.3	6.4	2.7	3.7	2.7	1.7	1.1
Imports	3.1	9.4	12.2	11.8	14.1	20.7	16.4	16.5
BALANCE	-0.4	-7.1	-5.8	-9.1	-10.4	-18.0	-14.7	-15.4

This deficit has steadily increased, particularly as a result of a strong Dollar and of high prices on the US market. Imports broke all records in 1984, at nearly 27.0m tonnes[17a], and accounted for more than 25% of the domestic market: the figure for January 1985 was 30.9%.[18]

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(16) Source : IISI.

(17) Japan Economic Journal, 19 February 1985

(17a) short tons

(18) Financial Times, 5 March 1985

In 1982 the US Administration signed an agreement with the EEC and with Japan which limited Japanese imports to 5.8% of the US market and Community imports to 5.4% of this market. Measures were taken at the end of 1984 to reduce the contribution of imports to less than 20% of the domestic market (18.5%); agreements are, or will be, signed with all the exporting countries, including :

Canada :	3.0%	of the market,
Spain :	0.67%	of the market,
South Africa :	0.42%	of the market,
Australia :	0.18%	of the market,
South Korea :	1.9%	of the market,
Brazil :	0.8%	of the market
Mexico :	0.3%	of the market

It is the developing countries (in Asia and, above all, in Latin America) which are most affected by these agreements which are effective for 5 years up to 1989[19]. This creates a new situation in which the developing countries, and particularly the Latin-American countries, are seen as the champions of an opening-up of markets which would allow them to compensate eventually for an external trading balance which has been in deficit for so many years.

TABLE 12 : TRADE IN IRON AND STEEL PRODUCTS BETWEEN LATIN AMERICA AND THE UNITED STATES (in millions tonnes)[20]

	1978	1979	1980	1981	1982	1983
Imports into Latin America	6.209	5.792	7.213	7.367	4.793	3.061
Latin-American exports	2.243	2.640	2.231	2.954	3.920	7.481
BALANCE	(3.966)	(3.152)	(4.978)	(4.413)	(1.873)	+4.419

(19) Cf Metal Bulletin, 21 December 1984, and Sidérurgia Latino-Americana, No. 294, October 1984 (ILAFA)

(20) Source : Sidérurgia Latino-Americana, November 1983 (ILAFA)
( ) = deficit.

Argentina, Mexico, Venezuela and, above all, Brazil have made massive contributions to this recent sharp reversal in trade flows.

II - THE ACCELERATION OF TECHNICAL DEVELOPMENTS

Crisis and restructuring do not necessarily mean decline. The iron and steel industry is in fact developing very rapidly.

High quality and new products

The crisis has triggered off or accelerated a move towards quality. The day of general-purpose steel is over; steel users, as a result of a lack of attention to their needs and their exigencies, are likely to transfer their demands to alternative materials. There is little chance today of any product being used in a complex construction unless the product is adapted to meet the specific exigencies of the user. The trend is towards iron and steel products of lighter weight, with higher strength and of more consistent quality.

Iron and steel production has therefore been drawn towards quality, under the influence of competition from alternative materials, together with the exigencies of users seeking economies in both energy and raw materials generally.

To the exigencies of the oil companies, dating back over many years, are now added those of other users: the makers of food cans, where tinplate comes into competition with aluminium and where interest is being expressed in TFS (Tin-free steel), or car manufacturers seeking lighter but stronger sheet steel. These users simultaneously demand :

- products of higher performance,
- products of consistent quality, and
- products at a competitive price.

It is within this context that the production of the "super sheets"[21] has developed. This phrase refers to :

a) high-strength sheet produced in CAPL (Continuous Annealing Processing Line) installations, now operating in Japan, the EEC countries and Brazil and soon to be operational in South Korea and Taiwan:

b) coated sheet, in particular galvanised sheet obtained from hot-dip baths or by electro-galvanising. The demand for coated sheet is high in Japan, Europe and the United States[22], with the result that many new production units are being installed :

- in the United States (Armco, US Steel, National Steel, Inland Steel, Bethlehem Steel, etc.) with a total new production capacity of 1,500,000 tonnes;

- in Europe (Spain, France, United Kingdom, Italy, Germany, Holland, Luxembourg and Belgium);

- in Japan (six major companies).

More generally a qualitative shift is operating within the iron and steel industry itself, where ordinary grades of steel are progressively being replaced by higher quality grades of steel :

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(21) Using the phrase employed by Usine Nouvelle, 24 January 1985 - "Les supertôles arrivent".

(22) TABLE 13 : THE DEMAND FOR GALVANISED SHEET IN THE UNITED STATES

(in millions short tons)

	1982	1983	1984	1985	1986	1987	1988	1989
Automobiles	1.2	1.7	2.1	2.1	2.0	2.4	2.8	2.8
Other uses	4.2	4.7	5.3	5.5	5.0	5.5	5.8	5.9
TOTAL	5.4	6.4	7.4	7.6	7.0	7.9	8.6	8.8

Source : Metal Bulletin, 10 April 1984

low-alloy, low-sulphur, low-phosphate and low-silicon steels and ultra-clean steels, resulting from more closely-controlled steelmaking and rolling. For this reason the very clear frontier which divided special steelmaking from ordinary steelmaking is beginning to disappear under the thrust of the general movement towards higher quality products.

NEW PROCESSES

The high-power electric furnace (UHP) is no longer a novelty but is tending to develop at the same time as the mini-steelworks :

- in the United States, where electric steel accounts for more than 30% of all steel production, and where it could soon account for 40%;

- in Europe, particularly in Italy, Spain, Sweden and Norway, where electric steel accounts for more than 50% of all steel production;

- in Latin America, in Mexico and Argentina and, above all, in Venezuela (more than 80%), etc.

Direct reduction processes[23] using iron ore and natural gas are being handicapped by the rising price of gas, and so are progressing more slowly than was forecast. They have been almost totally abandonned in Europe (Germany, United Kingdom) and also in the United States; it is only some oil-producing countries which are continuing along this road, and here new constructional work is being held back by war, as in Iraq and Iran, or by the crisis, as in Mexico.

By contrast new processes for direct reduction using ordinary coal (and not coking coal) seem now to be more promising. This is the case with the KR Process being put forward by KORF and VOEST-ALPINE which, having commissioned a plant at Baden (Germany) have now signed a first agreement for the construction of a 300,000 t/year installation in South Africa (with ISCOR)[24]; other projects are being discussed with the United States (with US Steel), in India and in Turkey[24].

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(23) The two main natural gas direct reduction processes are the MIDREX process (Korf and Voest Alpine) and the HYL Process (Hylsa-Mexico).

(24) Cf. Metal Bulletin, 4 and 19 April 1985.

It also applies to the plasma processes developed by the Swedish SKF company. These processes make it possible to produce either pig iron using ordinary coal and plasma (possibly by using old blast furnaces) or steel from scrap and plasma (in an electric furnace). Pilot installations are now in operation in Sweden.

The Thin Slab processes should make possible the direct casting of slabs which are sufficiently thin to go directly to the cold rolling mill, so saving the cost of the very expensive hot strip mill. Although a pilot plant is in operation at Kawasaki Steel in Japan this process will need a long process of development before it becomes fully operational.

This is not the case with the so-called Hot Direct Rolling process which involves passing the slabs from the continuous casting unit directly to the hot strip mill; this is already operational in Japan[25] on the basis of an excellent capacity for programming.

The continuous casting process is, however, developing at a very fast rate; between 1974 and 1984 the percentage of steel produced in this way increased :

- from 12% to more than 60% in the EEC (21% to 70% in Italy, 10% to 65% in France, 19% to 72% in Germany, etc.),
- from 25% to 90% in Japan (more than 95% at Kawasaki Steel),
- from nil to 60% in South Korea,
- from nil to 85% in Taiwan, and
- from 9% to more than 30% in the United States, with a very rapid acceleration since 1983-84; the percentage continuously cast likely to rise to 80% at Inland Steel from 1986 onwards.

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(25) For example the Fukuyama No.2 Plant (Nippon Kokan) where the percentage of slabs going directly from continuous casting to the rolling mill will soon reach 85%. Cf. Japan Economic Journal, 4 December 1984.

Finally the steel industry is "Taking informatics on board"(26). The informatisation and automation of the iron and steel industry is already taking place. This will make it possible to produce products of the precisely required quality and "just in time", to meet the users' demands. Informatics and automation do not just involve the hardware; they also involve both software and highly skilled personnel, not only in the data processing field but also engineers, technicians and skilled operators with a high level of general education and with an in-depth knowledge of metallurgy and the iron and steel industry.

The advance of the Japanese would seem to be the result less of their modern plant than of the generally high level of education of all iron and steel industry personnel (simple operatives of 'A' level standard*) and a general work organisation which favours the rapid and efficacious circulation of information, both from the top downwards and also from the base upwards.

No iron and steel industry can escape, in the long term, from the trend towards higher quality, or from the entry of informatics. This poses, amongst other matters, a training problem; not only the need to ensure appropriate and high levels of skill but also of raising the general level of education so that all personnel can be integrated into efficient and fluid communications networks. This is a constraint. As its counterpart the technical developments which are now taking place create new possibilities, whether of scale reductions or the utilisation of new raw materials such as ordinary coal. This is a real opening-up!

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(26) A loose translation of the title of an article, "L'acier est en train d'épouser l'informatique" in the French journal "Usine Nouvelle", 30 August 1984.

* In the original French the level of education quoted is "baccalauréat".

III - THE FACTORS AT WORK IN THE CRISIS - STAGNATION AND DYNAMISM - THE INCONSISTENT SITUATION OF THE IRON AND STEEL INDUSTRY IN THE DEVELOPING COUNTRIES.

Over the last ten years many explanations have been advanced on the subject of the crisis in the iron and steel industry. One of the most systematic analyses was that carried out by the International Iron and Steel Institute, entitled "Causes of the mid-1970's recession in Steel demand"(27).

12 - There is no single explanation. This is, effectively, the first conclusion of this very careful study, according to which "there is no single cause of what has been termed the crisis in the world iron and steel industry". In particular such a single cause should not be sought on the basis of oil shocks. As the document emphasizes the iron and steel crisis dates back to before 1973-1974 and, in addition, it continued and has even become more acute since 1980 whilst the price of oil once again began to fall.

It is true that the influence of the price of energy on the industry which is the largest consumer of energy cannot be totally ignored. But this must not be allowed to mask the effect of the "monetary shocks" of 1967 and of 1971 and of their consequences, for example through the erratic development of the Dollar and its effects both on the total amount of external debts (with rising interest rates) and on the attraction of the United States market because of the high-priced Dollar.

It would also seem that the internationalisation of iron and steel (as has already been indicated the share of world production traded on foreign markets increased from 10.7% in 1950 to 23.7% in 1974) has made the various national iron and steel industries more sensitive to (and more easily damaged by) movements arising from elsewhere.

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(27) Committee on Economic Studies. Brussels, 1980.

Furthermore it became even clearer after 1974 that the apparent consumption of steel depends much more on changes in the Gross Fixed Capital Formation (GFCF) than on changes in the Gross National Product (GNP). As is well known the structure of the GFCF is being rapidly transformed by the increasing integration of light engineering, electronics and software, all these activities and installations consuming very small quantities of steel.

13 - Changes in rolling efficiency : from raw steel to finished products

At the end of the Second World War it was normal to use 1400 or even 1500 kg of crude steel in the production of 1000 kg of rolled products. This overall efficiency has been steadily improved, in particular by the replacement of casting in ingot moulds by the continuous casting process.

The following table shows the improvements made in Japan.

TABLE 14 : IMPROVEMENTS IN ROLLING EFFICIENCY AND STEEL ECONOMIES(28)

(in millions tonnes)

Year	Crude steel production (A)	Rolled products produced (B)	Percentage yield (B/A)	Steel needed at constant yield (C)	Steel gained as compared with 1960 (C) - (A)
1960	20.8	16.08	76.3	20.8	-
1962	26.7	20.9	78.8	27.1	0.39
1964	38.1	30.2	78.4	39.2	1.13
1966	46.2	36.8	79.5	47.8	1.64
1968	65.2	52.5	80.9	68.1	2.95
1970	89.9	72.4	79.8	94.1	4.19
1972	94.8	78.7	83.1	102.3	7.48
1974	113.8	97.3	84.9	126.4	12.51
1976	104.4	90.1	85.5	117.1	12.6
1978	100.6	88.2	88.0	114.5	13.8
1980	109.1	98.7	90.4	128.1	19.0

(28) "Steel Demand Forecasting", IISI Brussels, 1983. p. 1-40.

This means in fact that in 1980 :

- with a production of crude steel which was lower than that of 1974 the iron and steel industry achieved a production of rolled products which was higher than that produced in 1974 (98.7m tonnes as against 97.3m tonnes);

- the Japanese iron and steel industry had effected an economy of 19.0m tonnes of crude steel as compared with the amount which would have been required if the efficiency had remained unchanged since 1960.

These figures relate to the Japanese iron and steel industry, the most productive in the world; however other industries have followed with a lag of some years - some 5 to 6 years in the case of France where the situation in 1980 can be compared with that in Japan in 1974.

Finally it must be recalled that the rolled products of 1980 or 1985 have a usage value which is very much higher than the usage value of 1960 rolled products. This is the result of the problems posed by changes in the specific consumption of steel.

!4 - Changes in the specific consumption of steel

The specific consumption of steel is measured by the (national) apparent consumption of steel in relation to the gross domestic product. It is found that the specific consumption of steel is falling in all the industrialised countries belonging to the OECD or the CMEA. This fall has accelerated during the recent perica (the end of the seventies); in France it has reached the figure of -2.2% per year[29].

Changes in the specific consumption depend both on :

- economic factors, that is to say the more or less marked dynamism of the steel using activities, in particular :
  - . building and public works,
  - . the production of means of transport,
  - . metal fabrication,
  - . mechanical and electrical engineering: in France in 1980 these alone accounted for 80% of the end-uses of steel.

(29) This phenomenon has been studied in France by OTUA (Chambre Syndicale de la Sidérurgie Française) and has also been the subject of a study by the Economic Commission for Europe, Geneva, ECE/STEEL/45, New York, 1984.

- and technical factors, linked to the evolution of products and their quality (lightness, higher strength) as well as competition from other materials.

Between 1970 and 1977 it was found that specific consumptions in the Federal Republic of Germany fell from :

- 873 kg to 668 kg of steel per 1000 kg of shipbuilding products;
- 612 kg to 557 kg of steel per 1000 kg of rail rolling stock(30).

Between 1950 and 1980 the average strength of steel used in France for reinforcing concrete was multiplied by 4, being reflected in 1980 by economies of 1,600,000 tonnes of concrete reinforcing rod as compared with what would have been needed in 1956 for the same volume of building.

Machinery manufacturers prefer abrasion-resistant sheet for mining equipment and lighter steels, either alloyed or stainless, in the case of office machines. These changes are particularly evident in car manufacture in the United States where the average weight of a vehicle has fallen from :

- 1800 kg in 1970 to
- 1397 kg in 1980, and to
- 925 kg in 1985.

To build the same number of cars, therefore, would require only 770,000 t. in 1985 as against 1,570,000 t. in 1975.

In Japan the structure of the materials used by car manufacturers has evolved in the following manner :

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(30) Source : EEC Geneva - Economic Commission for Europe. Steel/AC.6/R.15, May 1984.

TABLE 15 : CHANGES IN THE STRUCTURE OF MATERIALS USED IN CAR MANUFACTURE IN JAPAN (as percentages)(31)

	1973	1977	1980	1983
Total steel	81.1	80.9	78.0	76.0
Of which :				
. Ordinary steel	63.6	59.9	54.8	48.8
. High quality steel	17.5	21.0	23.2	26.4
Of which :				
. High strength		(0.5)	(1.4)	(4.1)
. Coated		(4.4)	(7.1)	(7.8)
. Alloy steels	(17.5)	(16.1)	(14.7)	(14.3)
Non-ferrous metals	5.0	4.7	5.6	5.6
Plastics materials	13.4	14.4	16.4	18.4

The fall in the specific consumption is widespread in the industrialised countries, both in the OECD countries and also those which belong to the CMEA.

The situation is different in the developing countries where, on the contrary, the specific consumption of steel is rising.

TABLE 16 : CHANGES IN THE SPECIFIC CONSUMPTION OF STEEL IN VARIOUS COUNTRIES (kg of steel per US$ GDP)

	1960	1970	1980
FRANCE	0.084	0.084	0.050
UNITED STATES	0.097	0.101	0.063
USSR	0.435	0.262	0.218
SWEDEN	0.101	0.094	0.053
BRAZIL	0.067	0.074	0.079
REP. OF KOREA	0.026	0.088	0.190

Source : Economic Commission for Europe Steel/AC.6/R.15 - May 1984.

(31) Source : Japan Metal Bulletin, 6 October 1983.

The change is a positive one in Brazil: it is particularly dynamic in the case of South Korea, and was so for a long period in Japan[32]. The same probably applies where the bases for an industry and a modern economy are being constructed in areas of high population density, in Asia more than in Africa or in Latin America.

15 - Peripheral dynamisms and the new geography of steel

The dynamism of the developing countries contrasts with the stagnation and relative decline of the iron and steel industry in the most industrialised countries, and this forms part of a long historical process in which the most dynamic changes appear and are established successively in areas increasingly distant from the oldest centres.

Great Britain is the historical focus of the iron and steel industry; in 1860 the British industry produced more than half of all the cast iron, iron and steel produced throughout the world. Then, during the 1870's, Great Britain lost its position to Germany which, in turn and before the end of the 19th century, gave way to the United States of America. The USA maintained its supremacy for more than seventy years, up to the beginning of the 70's when the USSR became the world's leading steelmaking country. In 1984 the Soviet iron and steel industry was still in that leading position, but it was the Japanese industry which could be seen, from the mid-seventies, as the most dynamic of the iron and steel industries, offering the whole world its technical assistance services based on its astonishing capacities for innovation and process development. With production stagnating in Japan the new dynamism has passed to some of the developing countries which have demonstrated an extremely rapid rate of growth since 1974.

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(32) The 18 bridges which Japan has built between its constituent islands utilised some 3 million tonnes of steel, whilst the artificial isle built in Tokyo Bay for the construction of an iron and steel unit necessitated the use of 1.4 million tonnes of steel, or 250 kg per m^2.

TABLE 17 : THE EVOLUTION OF THE PRODUCTION OF STEEL (crude) IN SOME DEVELOPING COUNTRIES (in millions of tonnes)

	1974	1984	Index : 1974 = 100
People's Republic of China	21.1	43.7	207
Republic of Korea (South)	1.9	13.0	684
D.P.R. of Korea (North)	3.2	6.2	193
Taiwan	0.6	5.0	833
India	7.0	10.5	150
Brazil	7.5	18.4	245
Mexico	5.1	7.5	147
SUB-TOTAL	43.4	104.3	240
Other developing countries	11.6	14.7	126
TOTAL	55.0	119.0	218

Source : IISI

This table shows that :

- seven countries (5 Asiatic + 2 Latin-American) accounted for 78.9% of the total steel production of the developing countries in 1974, but 87.5% in 1984;

- five Asiatic countries accounted for 70% of the additional production between 1974 and 1984 of the developing countries (64,2% for four Asiatic countries if India is left out).

This dynamism and these rates of growth are linked less with iron and steel production intended for export (these countries still have an overall deficit) than with a rising specific consumption of steel and, in certain cases, a real "hunger" for steel.

16 - Contradictory situations for the developing countries : a dynamism held back by constraints.

Recent changes illuminate the contradictory situations which are affecting the developing countries, in which :

- there is on the one hand a dynamism reflected in the rising specific consumption of steel;

- coupled with constraints laid on the consumption, production and production capacities for iron and steel by direct and indirect financial charges, in particular those linked with debts.

In this respect it is revealing to carry out a survey on the present state of the iron and steel projects launched by or decided on by the developing countries, as these were listed within the framework of the preparatory work for the Third Consultation on the Iron and Steel Industry held in Caracas in September 1982(33). It was found, when examining the situation project by project, that numerous projects had been either :

- delayed, or
- frozen, or
- completely abandonned.

In the developing countries the UNIDO scenarios listed all the projects under construction, launched or the subject of a firm decision; these represented a new capacity of about 63 million tonnes of steel up to 1990.

At the present time these delays, freezing or abandonment of projects have had the following consequences :

- In Africa South of the Sahara (excluding South Africa) the new additional capacities, available in 1990, will be 2.700m tonnes instead of the 3.270m tonnes listed in 1982 because of :
  - the abandonment of the major project in TANZANIA,
  - the freezing of the projects in KENYA,
  - the deferral to an indefinite date of the extension projects in MOZAMBIQUE and in ANGOLA,

(33) 1990 Scenarios for the Iron and Steel Industry, UNIDO - ID/WG.374/2. July 1982. This refers to the so-called "low growth" scenario.

to which should be added the delays in the construction of the projects in NIGERIA (Ajaokuta and the downstream rolling mills of Delta Steel).

- In the Middle East and in North Africa the new additional capacities available in 1990 will be 7.500m tonnes, instead of the 9.700m tonnes listed in 1982 because of :
  - the delay in the Algerian Bellara project which will not come on stream before the beginning of the nineties,
  - of the delays in progressing the Iranian projects,
  - of the delay in extending the Tunisian unit,

to which should be added the delays in constructing the MISURATA (Libya) and DEKHEILA (Egypt) projects.

- In Latin America the new additional capacities available in 1990 will be 13.5m tonnes instead of the 28.100m tonnes listed in 1982, because of :
  - the deferral to an indefinite date of the SOMISA extension, together with other projects in ARGENTINA,
  - the freezing of all the projects in COLOMBIA,
  - the freezing of the Chimbote extension projects in PERU,
  - the deferral to an indefinite date of the Usiminas Phase IV in BRAZIL,
  - the definitive abandonment of the Zulia unit in VENEZUELA,
  - the deferral to an indefinite date of the construction of the TAMPICO unit, the HYLSA extension and several other projects in MEXICO,
  - the deferral until after 1990 of the second extension (over and above 1.0m tonnes) of the iron and steel industry in CUBA.

- In Asia the new additional capacities available in 1990 will be 14.5m tonnes instead of the 22.4m tonnes listed in 1982 because of :
  - the abandonment of the project for an integrated iron and steel unit in the PHILIPPINES,
  - the abandonment of the project for an integrated iron and steel unit in THAILAND,
  - the abandonment (provisional ?) of the PARADIP (Daitari) project and the delays in the VIJAYANAGAR project in INDIA,

- the further deferral of the construction of the second phase of the PIPRI unit in PAKISTAN.

Re-examination in 1985 of the projects listed in 1982 shows the following changes :

TABLE 18 : 1982 LISTING AND 1985 SITUATION (in millions tonnes crude steel)

	New capacities up to 1990 (1985 data)	New capacities up to 1990 (1982 data)	Difference
Africa South of the Sahara	2.700	3.200	-0.500 (-15.6%)
Middle East and North Africa	7.500	9.700	-2.200 (-22.6%)
Latin America	13.500	28.100	-14.700 (-51.7%)
Asia	14.500	22.400	-7.900 (-35.2%)
TOTAL rounded to	38.200 38.000	63.400 63.000	-25.000 (-39.6%)

Sources : 1990 Scenarios for the Iron and Steel Industry, UNIDO
Metal Bulletin : Latin-American Iron and Steel Industry
Metallurgy Review, Unesid; Financial Times

Under these conditions the available production capacities in the developing countries in 1990 will amount to :

Production capacities installed in 1980 = 76.0 million tonnes
+ Capacities installed up to 1990 = 38.0 million tonnes
giving an overall total of 114.0 million tonnes.

This excludes China and North Korea; on the assumption of a mean operating rate of 80% this would make it possible to produce :

114.0 x 0.80 = 91.2 million tonnes.

This is to be compared with an apparent consumption (on the IISI hypothesis) of 122.0 million tonnes, indicating a deficit of more than 30.0m tonnes, to which should be added the certain deficits of China and North Korea.

This deficit is likely to increase from 10.0m tonnes in 1984 to some 15.0m tonnes by 1990, on the assumption that China and North Korea acquire an additional 12.5m tonnes of production capacity by 1990 (which is optimistic) and that the consumption of these countries rises between 1984 and 1990 by an average of about 4% a year (which is on the contrary rather pessimistic!).

One thing is therefore quite clear: the developing countries will continue to have deficits, and will remain importers of iron and steel products (about 40.0m tonnes). There is hardly any chance of this situation being modified and even less of it being reversed between now and 1990, despite the remarkable exporting sorties of some of the developing countries.

The dynamism and the potential of the developing countries in respect of iron and steel is very real, but for the time being they are being held back from putting this into effect.

IV - DEVELOPMENTS IN THE WORLD IRON AND STEEL INDUSTRY : TRADING FLOWS - COMPETITION AND COMPLEMENTARITY.

17 - Major markets and trading flows

During the last thirty years there has been a process of internationalisation of the iron and steel industry in the form of an acceleration of trading: from 10% of world production to more than 25% by the start of the eighties.

This development of trading is marked both by the existence of major importers and also of major exporters. The principal centres for exports are Japan, the EEC countries and then the other European countries.

JAPAN has become, and still remains, the leading exporter with an export balance which varies between 26m and 32m tonnes per year.

Japan's leading customers are the developing countries: first of all China (with nearly 8m tonnes per year), South-East Asia and the Middle East; then the United States (between 5m and 7m tonnes) and finally the USSR: the EEC remains only a marginal customer.

The EEC was for many years the world's leading exporter, being overtaken by Japan at the start of the seventies. The positive exporting balance, which rose to more than 25m tonnes, is now tending towards a figure of 15m tonnes. The United States is the leading customer of the EEC, which also sells to the CMEA countries, the Middle East and Africa, together with Latin America and Asia in more limited quantities.

The other European countries were net importers until 1977 (with an external deficit of 3.8m tonnes in 1974); they have now become net exporters (4.1m tonnes in 1983) due, in particular, to the Spanish, Finnish and Austrian iron and steel industries.

The principal importing regions are the United States and the developing countries.

The UNITED STATES have, for many years now, been net importers. Their trading deficit has risen from 8.8m tonnes in 1974 to more than 20m tonnes in 1984. Although some US exports (1m tonnes in 1983) go mainly to Latin America the imports into the US come mainly from Japan and the EEC and, in rapidly increasing quantities up to 1984, from several developing countries and some CMEA countries (Romania, Poland). Whereas the contribution of Japanese exports to US imports has fallen from nearly 50% in 1975 to 25% in 1983, and the EEC share has also fallen from 36% to 24%, the contribution from the developing countries has increased from 5% to 37% with South Korea increasing from 3.5% to more than 10% and Brazil increasing its contribution from 0.3% to 8%. The United States remains a major importer, but one which operates a selective opening-up of its market, in particular in relation to the developing countries.

THE DEVELOPING COUNTRIES have become and remain major importers, their external trading balance evolving as follows :

TABLE 19 : EXTERNAL TRADE OF THE DEVELOPING COUNTRIES (in millions tonnes)

	IMPORTS		EXPORTS		BALANCE	
	1974	1983	1974	1983	1974	1983
Latin America	9.6	3.3	0.8	8.0	-8.8	+4.7
Africa	5.0	5.9	0.04	0.4	-5.0	-5.5
Middle East	7.1	13.3	0.04	0.6	-7.0	-12.7
Asia (including China and the PDR of Korea)	15.1	27.3	2.2	9.1	-12.9	-18.2
TOTAL	36.8	49.8	3.1	18.1	-33.7	-31.7

Source : IISI

Despite the positive balance of trade for Latin America the overall trading balance remains negative and of the same order of magnitude in 1983 as in 1974.

China has become one of the world's major importers with a total of about 10m tonnes, of which 80% comes from Japan. The new exporters are the Latin-American and Asiatic countries.

TABLE 20 : EXPORTS AND IMPORTS OF SOME DEVELOPING COUNTRIES (millions tonnes)

	1983 Exports	1983 Imports
Brazil	5.1	0.085
South Korea	5.7	2.128
Taiwan	2.1	1.370
Venezuela	0.9	0.450
Mexico	0.8	0.400
Argentina	0.6	0.680
Singapore	0.4	1.810
Hong Kong	0.3	1.820
TOTAL	15.9	8.740

Source : IISI

As may be seen from the above table these exporting countries are also importers, the positive balance being likely to fall considerably (in the case of Latin America) when the economic recovery is confirmed.

18 - By contrast the process of the internationalisation of iron and steel production does not seem to be progressing.

It will be recalled that in 1974-75 a major "redeployment" of the iron and steel industry towards those regions having iron ore, energy and space was announced. These major projects were located :

- in Latin America (Brazil, iron ore),
- in Australia (iron ore and energy),
- in Saudi Arabia (energy),
- in Tunisia (natural gas),
- etc.

The generalised reversal of this redeployment movement is reflected in the abandonment of all the major projects (with the exception of the TUBARAO project in Brazil) sponsored by the large Japanese or American firms showed, simultaneously :

- that it was not the right time for reorganising world iron and steel production on a basis of "subsidiary plants" under the control of the large companies, locating one or other segment of production on the basis of differentiated opportunities and advantages;

- that the existence of natural resources (iron ore, energy, space, etc.) was not - or was not any longer - a determinant factor in the location of the iron and steel industry.

The Japanese iron and steel industry is, today, the most modern in the world; unlike Great Britain, Germany, the United States and the USSR, Japan does not possess on its own territory either iron ore or coking coal which it has to import from Australia, Brazil, Canada, etc. The Japanese have been the teachers in the Republic of Korea and in Taiwan, countries in which the highest rates of growth between 1974 and 1984 have been recorded for the iron and steel industry. Conversely it may be seen that the existence of abundant resources of iron ore or of reducing agents has not been enough to ensure a rapid take-off of the iron and steel industry. Colombia, with the largest reserves of coking coal in Latin America, produces less than 400,000 tonnes of steel, whilst in the oil-producing countries, from Algeria to Venezuela, iron and steel production is developing more slowly than was forecast.

Australian executives continue to preach the doctrine of a return of the iron and steel industry towards its sources of supplies; it is possible that their cause will eventually succeed but not, in all probability, for some time to come.

It is, however, true that there is at the present time some growth in the international trading of semi-products, in particular slabs which are bought in from abroad, rather than from domestic production, for use in the production of coils, sheets, etc.

Such imports of semis make it possible to achieve economies in the upstream installation (pig-iron and steel production) which are very heavy and very costly. These semis come from the TUBARAO plant (Brazil) which exported half its production in 1984 (1m out of 2m tonnes); most of them went to foreign shareholders in the company such as Kawasaki Steel (Japan) and Finsider (Italy), who together hold 49% of the shares. Exports from Tubarao also go to the United States, Canada, Spain, Turkey, Yugoslavia, Taiwan, Iran and China.

International trading in semis is the result of a very considerable demand from the United States which is met not only from the Brazilian Tubarao plant but also from a variety of other sources.

TABLE 21 : IMPORTS OF SEMIS INTO THE UNITED STATES - JANUARY-FEBRUARY 1985

(in short tons)

United Kingdom	7,923	Japan	634
Germany	86,476	Mexico	617
Holland	5,734	Brazil	64,980
Belgium/Lux.	55,081	Spain	212
France	29,402	Finland	11,136
Italy	387	Poland	20
EEC	185,003	Romania	5,383
Canada	3,912	South Korea	13,638
Sweden	54,927		
		TOTAL :	340,462

Source : Metal Bulletin, 30 April 1985

These imports represent an annual rate of more than 2m tonnes, the contribution from Brazil accounting for only 19.1% of this total as compared with 54.4% for the EEC and 73.8% for Western Europe.

Exports of semis to the United States are likely to increase even further as a result of the restructurings which have taken place, but then are likely to fall off once the US iron and steel companies have modernised their installations and will be equipped for continuous casting, a process which has already started.

This limited increase in the trading of semis must not, however, be confused with any imminent multiplication of subsidiary plants.

19 - From the dynamism of trading to the organisation of markets

Within a context of prolonged crisis the dynamism of international trading comes up against the questions of the organisation and control of markets.

- The CMEA countries have always exercised strict (State) control over the selling and buying of iron and steel products. The purchase by the USSR of 6m tonnes of tubes from Finsider (1.2m tonnes of tubes annually over a period of five years)(34) will, for example, contribute towards a balancing of trading which has gone into deficit in the case of Italy, and in the same way the exporting of iron and steel products from Poland and Romania will help in meeting the debts of these countries.

- The EEC has become a very largely closed zone where, for many years, imports from non-EEC counties have been regulated and have reached a ceiling of less than 10m tonnes per year(35). It is probable that the liberalisation of the community market, envisaged for the end of 1985, will be deferred, at least until the end of 1987 (according to the wishes of France and Italy).

- The Japanese market has slowly opened up in recent years (imports account for less than 5% of the domestic market). It is probable that this trend will continue, but only at a very slow rate.

- Because of the rate of exchange of the Dollar and the recovery of its economy the United States has become a very attractive market. Under the pressure of its iron and steel industry the United States Administration decided to negotiate voluntary limits on imports from the exporting countries up to the end of 1989, so as to give the US iron and steel industry time to modernise itself.

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(34) Cf. Financial Times, 24 April 1985.

(35) In 1983 South Korea exported 10,000t of iron and steel products to the EEC.

- The only outlets which remain largely open are those offered by the developing countries.

It is true that Latin America has become largely exporting and only a very small importing region; it is however possible that, as a result of a lack of adequate investments, this region will return to importing well before 1990 if the economic recovery takes place.

The Middle East and Africa are importing zones; however the dynamism of the demand cannot be compared with that of Asia, in particular the Far East and China. The delayed investments in India, and above all in China, are such that this region is likely to become one of the major iron and steel markets at the end of the present decade and also in the beginning of the nineties.

20 - The development of South-South relationships

Trading between the countries of the South in iron and steel products is developing, and is no longer negligible(36).

This trading is developing :

- Within Latin America:

(see Table 22 on the following page)

- From Latin America (Brazil) and Asia (South Korea and Taiwan) to the Middle East, in particular to Saudi Arabia, the Emirates and Iran.

- From Latin America (Brazil and Venezuela) and Asia (Indonesia) to China. Indonesia has made a first delivery to China, whilst Brazil is negotiating exports to China of 1,500,000 tonnes of iron and steel products over a period of three years; Zimbabwe has announced an initial sale of 30,000 tonnes of long products to China.

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(36) Cf. P. Judet "Le développement des relations Sud/Sud dans la sidérurgie mondiale". Tiers Monde review, Vol. XXIV, No.96 - Oct.-Dec. 1983.

TABLE 22 : EXPORTS TO OTHER LATIN AMERICAN COUNTRIES (in thousands tonnes)

	1979	1981	1983
Argentina	249.5	306.4	52.0
Brazil	478.9	486.6	231.0
Mexico	14.4	1.6	31.3
Venezuela	46.1	55.2	87.3
Other countries	171.7	53.2	179.2
TOTAL	960.6	903.0	580.8

Source : Siderurgia Latino-Americana, March 1985.

- From the Far East (South Korea and Taiwan) to South-East Asia, in open competition with Japan. This resulted in a fall in Japanese exports during the first quarter of 1984 of :

- 44% to the Philippines,
- 31% to Singapore, and
- 22% to Malaysia(37).

These are routine iron and steel products (long products, coils) but also high-quality steels, including alloy and stainless steels from Brazil, South Korea and Taiwan. Competition in regard to Korean, Taiwanese and Indian stainless steels is developing in South-East Asia.

In addition to trade in iron and steel products there is also trading in iron ore (from India, the Philippines and Brazil) and in coking coal (from Colombia).

Furthermore the capacities of India and Brazil, and also South Korea, are now beginning to be shown in the field of plant engineering and equipment as well as in certain forms of Technical Assistance, such as from Mexico in the case of direct reduction. On the other side financing problems constitute a weak point which will allow the industrialised countries to defend and to maintain their dominant positions.

(37) Metal Bulletin Monthly, March 1985 (supplement)

V - THE ACTORS IN THE WORLD IRON AND STEEL INDUSTRY : STATES AND MULTINATIONAL COMPANIES

"We were waiting for the multinationals, but it was the State that took over" seems to be the lesson to be drawn from ten years of crisis.

21 - THE OMNIPRESENT STATES In every region of the world, and quite irrespective of the ideological positions being defended, the importance of the role assumed by the State has continued to grow.

The State has become a privileged shareholder in iron and steel companies: more than 50% of the world iron and steel industry is now State-owned.

TABLE 23 : STATE CONTROL OF IRON AND STEEL PRODUCTION

	% of total
United States	0
Japan	0
EEC	51.7
Other OECD countries	57.4
CMEA countries	100.0
Principal developing countries :	
Brazil	54.6
Mexico	50.0
Venezuela	87.0
India	74.6
South Korea	60.9
TOTAL	55.4

Source : Siderurgia Latino-Americana; October 1984

Furthermore, and in addition to their shareholdings in the capital of the iron and steel companies the States have extended their role to the area of defending national iron and steel industries by means of restructuring and the organisation of markets. In February 1984 the States of the European Community gave aid of more than US$ 25 billion to their iron and steel industries. This movement has affected not only the EEC but also the United States where the Secretary of State for Commerce negotiated a voluntary limitation of imports for a period of five years with the principal suppliers.

World iron and steel activity is tending to become a State matter, handled at government level, in the same way as activity in the textile industry which has been controlled for a period of 15 years by the multifibre agreement.

22 - The world iron and steel industry and the multinationals

The way in which the role played by the multinationals in the world iron and steel industry has evolved is not clear.

It is true that, on the one hand, there has been a movement towards taking up international shareholdings :

- the leasing for ten years of the rolling mill in a small Togolese unit (Societé Togolaise de Sidérurgie)(38);

- shareholding by two US companies in the State ISCOTT Company in Trinidad (20% by Bechtel, 20% by Luclede and 60% by the State of Trinidad(38);

- shareholdings by Japanese iron and steel groups in several US iron and steel companies(38):

  . Nippon Kokan has purchased 50% of the National Steel capital,

  . Nisshin Steel has a holding in the capital of Wheeling-Pittsburgh,

  . Kawasaki Steel purchased 25% of the capital of the Fontana California Works (ex Kaiser Steel) at the same time as Wilkinson, CVRD do Brasil and Finsider,

  . The British Steel Corporation has purchased a minority shareholding in Tuscaloosa Steel, Alabama.

Discussions have also started between POSCO (South Korea) and US STEEL on the subject of selling Posco a shareholding in the capital of Fairless, a subsidiary of the US company.

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(38) Cf information in Japan Economic Journal, Financial Times and Metal Bulletin

It will be noted that these shareholdings primarily involve the United States and that they constitute a way of overcoming the barriers which are being raised by means of an establishment within the country.

This is seen from the fact that the movement outside the United States, and apart from some isolated cases such as Togo and Trinidad, is one of withdrawal :

- the withdrawal of HOOGOVENS (Holland) and HOESCH (Germany), terminating the existence of the ESTEL Group into which these two companies had merged some years ago;

- the withdrawal of the THYSSEN Group (Germany) from the SOLMER company (France);

- the withdrawal of US STEEL from the C RAJAS project (Brazil), and the withdrawal of the same US company in regard to its investments in the Spanish iron and steel industry where US STEEL now only plays the role of a sleeping partner.

It may be concluded from these ambiguous movements that the internationalisation of the iron and steel industry is not developing along the lines announced at the beginning of the seventies. The internationalisation of production is marking time, whilst the omnipresence of the State is constantly being confirmed.

23 - Dominant positions and the risks of locking-up the system

The industrialised countries have not yet surmounted the crisis, but they are attempting to "maintain" the world iron and steel system.

Up to the present time they have largely controlled techniques: firstly Japan, but also the European countries (West Germany, Great Britain, France and Italy) without forgetting the United States (special steels, galvanisation processes, etc.) or the Soviet Union. It is true that there is considerable competition and that the role of the outsiders cannot be ignored (VOEST ALPINE in Austria, DANIELI in Italy and KORF in Germany) and that companies originating in the developing countries (India, Brazil, South Korea and Mexico) are becoming more obvious.

Financial power has been well maintained, to the point where today it is more determinant than technological capacity. On several occasions the United States, Japan and the EEC countries have manifested their intention to "lock-up" the system by opposing financing for the construction of new projects in the developing countries:

- the refusal of Japan to envisage the construction of a plant for weldless tubes in China,

- the refusal of Japan and the United States to support the new Korean KWANG-YANG project.

Those developing countries which are most dynamic and least affected by the crisis are able to carry on and, by working on an exacerbated competition, to have their projects financed. This is the case with the Korean Kwang-Yang project, the construction of which has been entrusted to Austrian, German and British companies (with a marginal French contribution) which have granted very favourable credit terms.

By contrast numerous other projects are awaiting financing : in Argentina, Kenya, Mexico, Colombia, Peru, Ecuador, Bolivia, Brazil, Thailand, Tanzania and the Philippines, resulting in them being delayed, frozen or even cancelled. In this context the future of the iron and steel industries in many developing countries has never been so difficult.

The reality resembles less a "low growth scenario", as was presented in Caracas in September 1982, than a scenario of crisis, the implementation of which is, at the present time, reflected :

- on the one side by the largely surplus production capacities in the United States and, above all, in Japan and in the EEC;

- on the other hand by the strongly adverse trading position of all the developing countries, without exception, a situation which is likely to become aggravated as soon as any economic recovery takes place, particularly in Latin America.

VI - THE PROBLEMS POSED BY A MORE INTEGRATED DEVELOPMENT BETWEEN THE IRON AND STEEL INDUSTRY AND THE CAPITAL GOODS INDUSTRY

24 - OBSERVATIONS

- The recent development of the production of capital goods in the developing countries has been less dynamic than that of iron and steel production.

TABLE 24 : STRUCTURE OF WORLD PRODUCTION OF THE MECHANICAL AND ELECTRICAL INDUSTRIES

	1970	1975	1980
Industrialised countries	96.7	95.7	94.5
Developing countries	3.2	4.3	5.5
TOTAL	100.0	100.0	100.0

Source : UN Yearbook of Industrial Statistics - ISII.38 Nomenclature.

- Those capital goods which are, apparently, of the simplest type are produced from various iron and steel products, coming from different production processes. For example simple objects such as water and flour mills require many categories of products in their manufacture.

- The diversity and complexity of the iron and steel products needed for the manufacture of first and second metal conversion products (capital goods, inter alia) comes into conflict with the narrow range of iron and sceel products which are manufactured in a very large number of developing countries.

Out of 91 developing countries (and excluding the smallest countries) it is found that :

- 19 produce hot formed sheets,
- 20 produce cold formed sheets,
- 12 produce special steels (often in small quantities and in a limited range of grades),
- 7 produce stainless steels,
- 5 produce electrical sheets,
- 4 produce high speed tool steels.

The contradiction is particularly serious in Africa South of the Sahara, but it is also serious within a more advanced region, such as ASEAN, where there is a wide gap between the iron and steel products manufactured locally and the needs of the capital goods industry.

It is true that the construction of capital in the developing countries calls not only on machinery and equipment but also on infrastructures (roads, bridges, railways, dams, administrative and industrial buildings, etc.) which fall in the "Construction and Public Works " sector and which mainly consume the simpler iron and steel products (long products).

- Any linkage between iron and steel production and the production of capital goods is, therefore, difficult; in no case is it of an automatic character, even in the case of very simple products such as swing-ploughs or other items of animal-drawn agricultural equipment.

The iron and steel and capital goods industries develop according to their own logics, and the convergence between these only takes place in a very gradual manner.

During successive periods (with possible overlappings) the iron and steel industry is primarily linked to the demand for infrastructures including, progressively, structual metal-work; it then progresses on to the production of equipment and of machines, from simple to more complex. The production of equipment and machines has its own logic, not only linked with the supply of iron and steel (and other) inputs, but also with the existence of forging, casting and machining installations, together with the availability of the corresponding vocational skills.

Taking into consideration the various components of capital construction, in addition to just the production of capital goods, makes it easier to identify the steps in a progressive integration of the two activities in question: on the one hand the iron and steel industry, and of the other the capital goods industries.

Those countries which are most advanced in the production of capital goods are also those which have the most diversified iron and steel production :

- of long products, light and heavy,
- of hot- and cold-rolled flat products, galvanised and tinned,
- of special steels, alloy and stainless,
- of electrical sheet,
- of weldless tubes.

These countries are :

- Argentina,
- Brazil,
- China,
- Taiwan,
- the Republic of Korea, and
- Mexico.

25 - Research : openings and routes

The implementation of a more integrated approach (between the iron and steel industry and the capital goods industry) must satisfy the following conditions :

a - To reduce the gap which separates simple iron and steel production and the production of even simple capital goods, but taking into account not only the production of capital goods but, in a wider sense, the construction of capital (in the sense of Gross Fixed Capital Formation), and including the building of infrastructures.

b - To take into consideration as a priority the intrinsic logic of each activity so as progressively to construct between them a solid and realistic linkage. The products of the iron and steel industry form, inter alia, the inputs to the first and second converting of metals. The iron and steel industry does not necessarily develop in a linear manner, from upstream to downstream: it also advances both by a descending movement (from the steelworks to the rolling mill) and also by a return movement (from the cold rolling mill to the hot rolling mill or from the tinning line to the cold rolling mill, etc.). An integrated approach becomes operational inasfar as it succeeds in identifying and accelerating the convergences between the two original lines of development.

It would appear that there are neither compulsory sequences nor automatic induction effects. The historical experience of the German Ruhr cannot necessarily be reproduced: there are both reciprocal interactions and subordinate linkages, arising from rigid flow-lines, between the iron and steel and mechanical engineering industries.

There is also the problem that these phenomena are poorly understood since they have not formed the subject of systematic and in-depth analyses.

c - It is therefore necessary, in this matter, to collect supplementary information and to move on to case studies.

It will be an advantage to supplement the available information in regard to the production of capital goods in the developing countries: such information would need to cover :

- the installed production capacities,
- the existing production levels,
- the capacities and production levels forecast for 1990.

The case studies will make it possible to identify the interactions between the iron and steel industry and the capital goods industry, so identifying not only the dynamic sequences but also the threshold effects and the effects of constraints, blockages, etc.

Such case studies could relate to countries selected from the various categories; for example :

- The Republic of the Congo (or Cameroon or Togo),
- Sri Lanka and (or) the Dominican Republic,
- Tunisia and (or) Zimbabwe,
- Malaysia (or Indonesia) and Colombia (or Venezuela),
- The Republic of Korea and Brazil.

It would be of value to supplement these case studies with reference case studies dealing with those countries where, over the last thirty years, dynamic interactions between the iron and steel industry and the capital goods industry have been manifested; for example :

- Finland (OECD), and
- Bulgaria (CMEA).

These reference case studies would make it possible to identify the modes of passage and the historical linkages between the iron and steel industry and the capital goods industry.

d - It would also be of value to question the validity of regional approaches, in particular in Africa South of the Sahara, where the lack of available resources, together with the dispersion of the existing iron and steel and engineering installations makes the launching, within a strictly national framework, of any dynamic evolutions very problematical.

e - The evaluation of the impact of technical development (or technico-economic evolutions) which can be forecast for the short and medium term in respect of the iron and steel industry and the first and second metal transformating industries in the developing countries is another necessary task.

A N N E X 1

ON THE SUBJECT OF DIRECT REDUCTION

The production of pre-reduced ore rose to 7,800,000 tonnes in 1983 from 7,500,000 tonnes in 1982 (+3.8%):

52.1% of this came from the MIDREX process,
39.0% from the HYL process, and
9.0% from other processes.

The installed production capacities were 19,000,000 tonnes in 1983; the operating levels rose to 41% during that year. Production and production capacities in 1983 were divided up as follows :

TABLE 25 : DIRECT REDUCTION - PRODUCTION AND PRODUCTION CAPACITIES

(in thousands tonnes)

Country	Capacity	Production
Argentina	930	949
Brazil	315	255
Burma	20	10
Canada	1625	538
India	180	42
Indonesia	2300	500
Iran	330	-
Iraq	485	-
Mexico	2025	1498
New Zealand	150	155
Nigeria	1020	162
Peru	100	26
Qatar	400	383
Saudi Arabia	800	351
South Africa	225	76
Sweden	70	20
Trinidad	840	283
USSR	417	15
United States	1090	-
Venezuela	4452	2468
Fed. Rep. of Germany	1280	70

Source : Metal Bulletin, 10 July 1984

A N N E X 2

IMPORTS
MARKET PENETRATION OF IRON AND STEEL IMPORTS INTO VARIOUS MARKETS

TABLE 26 : MARKET PENETRATION OF IRON AND STEEL IMPORTS INTO SOME MAJOR MARKETS FROM 1975 TO 1983 (as percentages)

	1975	1976	1977	1978	1979	1980	1981	1982	1983
UNITED STATES	13.5	14.1	17.8	18.2	15.2	16.3	19.1	21.8	20.5
CANADA	13.0	11.1	12.1	11.5	14.5	10.6	22.7	12.8	n.d.
JAPAN	0.4	0.2	0.3	0.4	1.4	1.1	2.3	3.4	4.9
EEC	7.4	10.0	10.9	7.0	7.2	10.3	7.1	10.1	9.9

Source : Siderurgia Latino-Americana, No. 294, October 1984

TABLE 27 : IRON AND STEEL IMPORTS INTO THE UNITED STATES BY REGION OF ORIGIN (in thousands tonnes)

	JAPAN	EEC	CANADA	OTHER I.C.*	BRAZIL	SOUTH KOREA	OTHER D.C.**
1975	5844	4123	1009	674	43	397	122
1976	7984	3188	1304	623	67	790	329
1977	7820	6833	1892	1416	65	790	491
1978	6487	7436	2364	2624	292	1052	880
1979	6336	5405	2354	1632	432	986	373
1980	6007	3887	2370	1430	458	1040	303
1981	6220	6482	2890	2095	548	1218	437
1982	5183	5646	1844	1838	605	1062	485
1983	4236	4113	2379	1958	1257	1728	1397
1st Q. 1984	1630	1387	826	1006	444	532	642

* Other industrialised countries ** Other developing countries

Source : Idem.

TABLE 28 : EXPORTS FROM LATIN AMERICA IN 1983 (in thousands tonnes)

	TOTAL EXPORTS	EXPORTS TO THE U.S.	
		Volume	%
Argentina	540	220	40.7
Brazil	4900	1160	23.7
Mexico	860	500	58.1
Venezuela	800	130	16.3
Other countries	240	60	25.0
TOTAL	7340	2070	28.2

Source : Siderurgia Latino-Americana, February 1984

ANNEX 3

TABLE 29 : GROWTH OF INVESTMENTS IN THE IRON AND STEEL INDUSTRIES OF VARIOUS CONTRIES (in US$ millions)

	1965	1979	1980	1981	1982	1983	1984
Belgium	142	212	343	283	311	-	
France	169	460	451	401	311	-	
Germany	311	719	931	851	733	828	
Italy	246	553	629	598	958	681	
Luxembourg	24	164	146	106	70	38	
Holland	37	119	105	102	104	122	
United Kingdom	138	642	427	312	266	146	
EEC	1071	2871	3035	2656	2842	-	
Canada	141	227	-	-	-	-	
Japan	510	2601	3073	3602	4473	4087	
United States	1818	3367	3400	3451	4000	-	
Brazil	-	-	2712	2881	2224	1160	1000
Poland*	5030	24133	18750				
Czecho-slovakia**	2700	5400	4300	3200	3000	3000	
USSR***	1500	3360	3034	3161	3337	3295	

* in Zlotys ** in millions Crowns *** in millions Roubles

Source : Siderurgia Latino-Americana

TABLE 30 : THE FINANCING OF IRON AND STEEL INVESTMENTS IN LATIN AMERICA (in US$ millions)

	1979	1980	1981	1982	1983
Own resources	311.5	510.4	703.6	808.2	754.0
Resources of national origin	963.1	779.8	931.8	593.6	483.9
Resources of foreign origin	1105.0	574.7	852.8	268.4	771.9
TOTAL	2379.6	1864.9	2488.2	1670.2	2009.0

Source : Siderurgia Latino-Americana, March 1985

ANNEX 4

TABLE 31 : AID TO STATES FOR THE RESTRUCTURING OF THE IRON AND STEEL INDUSTRIES IN THE EEC (February 1984) (in millions ECU)

COUNTRY	NOTIFIED AID	OF WHICH CONDITIONAL AID *
Belgium	4,304	2,196
Germany	4,314	3,616
Greece	6	-
France	7,613	2,112
Italy	10,270	8,609
Ireland	231	-
Luxembourg	540	396
Holland	514	420
United Kingdom	5,763	2,674
T O T A L	33,636	19,891

Source : Siderurgia Latino-Americana, October 1984

* Conditional aid : granted as a function of reductions in productive capacities.

33,636m ECU = US$ 27,900m in February 1984.

A N N E X 5

PURCHASING SECOND-HAND EQUIPMENT

The reductions in production capacities in Europe and the United States have had the effect of making available equipment which is now the subject of sales, often after renovation.

CHINA, in particular, has purchased, or is in the process of purchasing, such equipment* :

- equipment from the Fontana unit (California, ex Kaiser Steel),
- the mini-plant from Dudley in Great Britain (1 UHP electric furnace of 35 tonnes, one 3-line continuous casting unit, etc.),
- the Jones & Laughlin plant from Aliquippa in the United States.

CHINA is interested in purchasing :

- the No. 1 continuous hot-rolling line from Kure (Japan),
- a wire-drawing line from Valfil (Belgium),
- a mini-steelworks from California (Soule-Steel, 120,000 tonnes, 2 electric furnaces),
- another mini-steelworks from Roundoak, Great Britain (2 electric furnaces)**

MEXICO is interested in a rolling-mill in Great Britain.

TURKEY has bought equipment (one 100-tonne electric furnace and one rolling-mill) from a British mini-steelworks.

A PAKISTANI company has purchased a second-hand mini-steelworks (two 30-tonne electric furnaces, continuous casting, one wire-drawing mill, etc.)***

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* Cf. Business China, 26 September 1984

** Cf. Metal Bulletin, 25 September 1984 and 26 April 1985

*** Metal Bulletin, 12 June 1984

A N N E X 6

MASTERY OF THE PRODUCTION OF CAPITAL GOODS AND INDIRECT EXPORTING OF STEEL : THE CASE OF BRAZIL

The growth of indirect trading in steel is significant in showing the increasing integration between the iron and steel and capital goods industries.

TABLE 32 : THE DEVELOPMENT OF INDIRECT TRADING IN STEEL IN BRAZIL
(in thousands of tonnes of rolled products)

YEAR	INDIRECT EXPORTS (A)	INDIRECT IMPORTS (B)	BALANCE (A - B)
1974	197	744	(547)
1975	249	688	(439)
1976	258	490	(232)
1977	343	400	(57)
1978	494	327	167
1979	675	306	369
1980	934	301	633
1981	1036	309	727
1982	671	208	463
1983	750	141	609
1984*	1190	105	1085

* Forecasts.

TABLE 33 : STRUCTURE OF THE INDIRECT IMPORTS AND EXPORTS OF STEEL IN BRAZIL IN 1983 (in thousands of tonnes of rolled products)

	REAL CONSUMPTION (A)	INDIRECT IMPORTS (B)	INDIRECT EXPORTS (C)	C/A (%)
Automobile	1303	25	254	19.5
Rail rolling stock	156	3	24	15.3
Shipbuilding	215	25	-	-
Agricultural machines	422	-	24	5.7
Mechanical equipment	803	46	95	11.8
Electrical equipment	158	22	18	11.4
Civil building	1980	2	33	1.7
Semi-finished products	645	5	272	42.2
Durable consumer goods	609	4	10	1.6
Miscellaneous	928	9	20	2.2
TOTAL	7223	141	750	10.3

Source : Siderurgia Latino-Americana, February 1985

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